CALIBRATION STANDARDS CORPORATION

# PRECISION VOLTAGE REFERENCE

## MODEL PVR-1A/1AR

SERIAL SP-213 .

Revsd 17 Mar. 65

CALIBRATION STANDARDS CORPORATION

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# SECTION I

## INTRODUCTION

1.1 Calibration Standards Corporation's Model PVR-1A/1AR, Precision Voltage Reference, is an extremely stable and accurate laboratory standard voltage source.

1.2 The PVR-1A/1AR furnishes both a fixed voltage of 1.00000 vdc and a voltage variable from 1.01000 to 1.02000 vdc.

1.3 Its principle uses include: as a standard voltage for a comparator, as a calibrator and as a voltage reference for laboratory potentiometers and Kelvin-Varley dividers.

1.4 Since the basic reference of the instrument is an ultra-stable, aged, temperature compensated zener diode, the Model PVR-1A/1AR is ready for immediate use following exposure to wide variations in temperature or a high degree of shock or vibration.

1.5 Excellent long-term stability and accuracy is achieved by the utilization of low temperature coefficient, precision wirewound resistors in all critical circuits.

1.6 All silicon solid state devices are employed throughout the instrument.

1.7 The circuit design is such that the output can be shorted for long periods of time without loss of accuracy or damage to the instrument.

1.8 Because of its small size, 8" x 7" x 6"; light weight, under 6 pounds; and low power consumption, 2 watts; the PVR-1A is ideally suited as a portable calibrator.

# SECTION II

## SPECIFICATIONS

| | | |
|---|---|---|
| 2.1 | Output Voltage Range | 1.00000 vdc fixed<br>1.01000 to 1.02000 variable |
| 2.2 | Accuracy | ±0.005% at 25°C |
| 2.3 | Dialout | 6 digits |
| 2.4 | Output Impedance | 5000Ω/volt |
| 2.5 | Stability | ±.002% (20 ppm)/month<br>±.004% (40 ppm)/year<br>±.0005% (5 ppm)/°C from +10°C to +40°C |
| 2.6 | Dialout Linearity | ±.002% |
| 2.7 | Line Regulation | ±.001% (10 ppm) for ±10% line change |
| 2.8 | Input Voltage | 117 vac, 50-60 cps |
| 2.9 | Input Power | 2 watts |
| 2.10 | Size | 8"w x 7"h x 6"d |
| 2.11 | Weight | 6 pounds |

# SECTION III

## OPERATING INSTRUCTIONS

3.1 Unless requested otherwise, this instrument is supplied wired for 117 vac, 50-60 cycle operation.

3.2 Turn the POWER switch to ON and allow 30 minutes for warmup.

3.3 If output of 1.0000 volt is desired, connect leads as follows.

3.3.1 Positive to red "1.0000v" terminal.

3.3.2 Negative to black "com" terminal.

3.3.3 The "GND" terminal is connected to the instrument chassis and may be used to bond the PVR to external instrumentation.

3.4 If output of between 1.01000 to 1.02000 volts is desired, connect leads as follows.

3.4.1 Positive to red "POS" variable output terminal.

3.4.2 Negative to black "com" variable output terminal.

3.4.3 The "GND" terminal is connected to the instrument chassis and may be used to bond the PVR to external instrumentation.

3.4.4 Set the variable READOUT knob to the desired last three digits to obtain the indicated output voltage.

3.4.5 Note 1.02000 volts is set as 1.011000

# SECTION IV

## CIRCUIT DESCRIPTION

4.1 A dc voltage of approximately 47 volts is supplied by transformer T1, the half wave rectifier D1, and filter capacitors and resistors C1A&B and R1 and R2.

4.2 The unregulated DC supplies a two stage transistorized regulator consisting of Q1 and Q2 with their biasing resistors and diodes.

4.3 The reference for Q2 consists of four low temperature coefficient zener diodes D2 through D5. The current through these diodes is provided by R1 and R6. R5, a negative temperature coefficient resistor, compensates for the positive coefficient of the circuit.

4.4 The preregulator provides a source current through R7, a carefully selected wirewound resistor for the primary reference diode D6. D6 is a proprietary Calibration Standards Corporation package specifically developed for its application. It is carefully processed and selected for low noise, long term stability, and temperature coefficient prior to incorporation in the instrument.

4.5 Wirewound resistors R9 through R16 divide the zener voltage, approximately 6 volts, of D6 to provide the fixed and variable reference outputs.

# SECTION V

## CALIBRATION

5.1 The following equipment or its equivalent is recommended.

5.1.1 Julie Research Laboratories Saturated Cell Bank, Model SCO-106.

5.1.2 Hewlett-Packard Null Detector, Model 425A

5.2 Connect the variable output terminals of the PVR-1A/1AR in series with 5.1.1 and 5.1.2. Observe correct polarity.

5.3 Set the READOUT dial of the PVR to the accurately known value of 5.1.1.

5.4 Adjust variable resistors R9 and R10, coarse and fine adjustments, until a balance is indicated on 5.1.2.

## WARRANTY

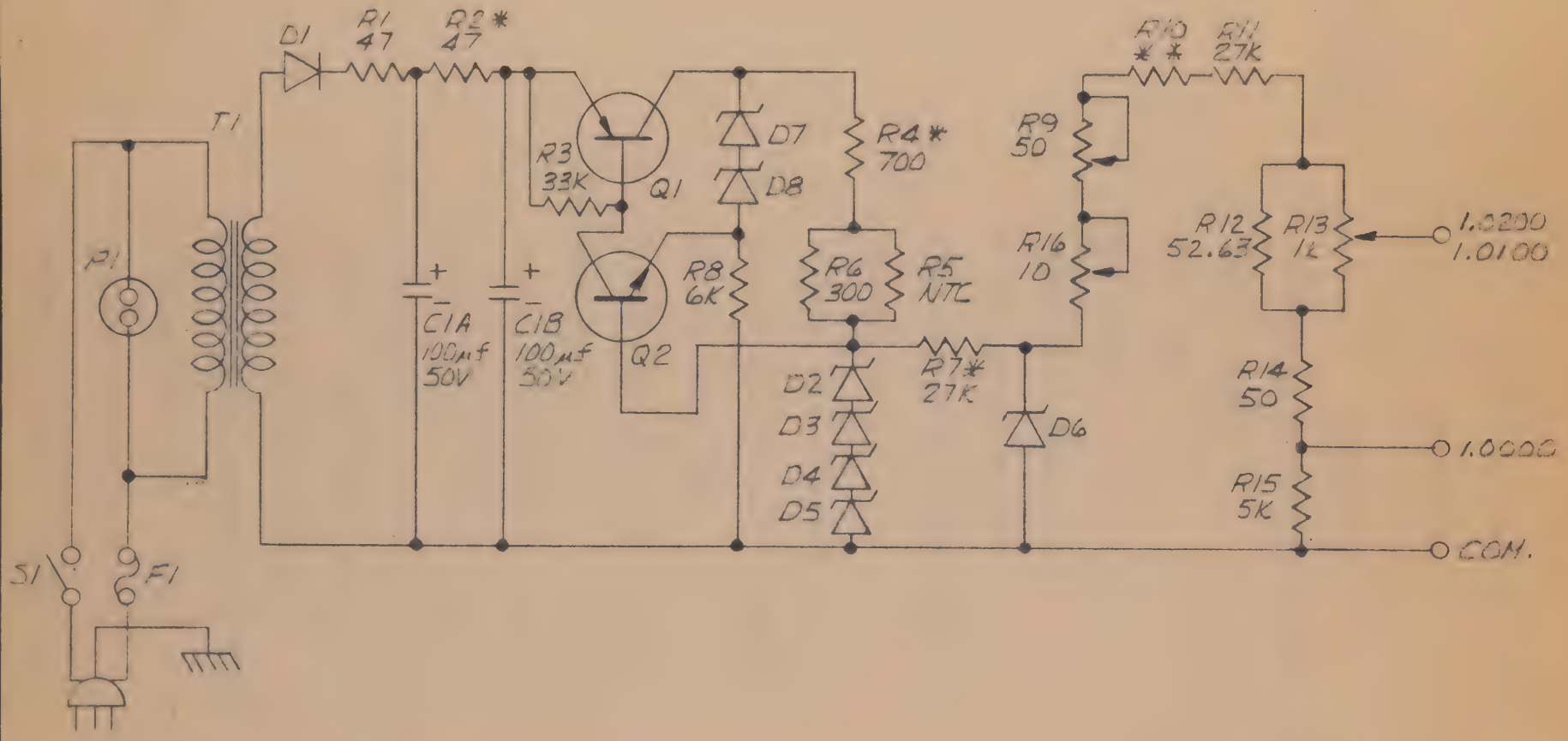
The CALIBRATION STANDARDS CORPORATION warrants each instrument to be free from defects in material and workmanship. The instrument must be returned to the factory with shipping prepaid and a complete report of the difficulty. This warranty is good for one year from the shipping date.

## SHIPPING DAMAGE

If there is any damage to the instrument upon receipt, report this to the transportation claim agent immediately.

| DRAWING NO. | SYM |
|---|---|
| 340-09 | C |

| SYM | DESCRIPTION | DATE | BY | APP'D |
|---|---|---|---|---|
| C | REVISED & REDRAWN WAS 526-017 | 11-27-64 | AS | |




3. ALL RESISTORS ARE IN OHMS
2. ** NOT USED IN ALL INSTRUMENTS
1. * APPROX VALUE ; SELECTED IN TEST

NOTES:

| TOL. | DATE 11/27/64 | CALIBRATION STANDARDS CORPORATION ALHAMBRA — CALIFORNIA | |
|---|---|---|---|
| | DWN CAS | | |
| | CHKD CAB | TITLE SCHEMATIC - PVR-1A | |
| | APP'D | | |
| | SCALE | NEXT ASSY | DRAWING NO. 340-09 SYM C |
| | | USED ON 456-03? | |

# REPLACEMENT PARTS LIST

## PVR-1A/1AR

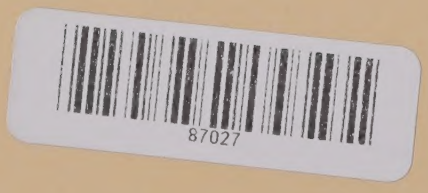
| Reference or Quantity | Description | Stock Number |
|---|---|---|
| T1 | Transformer, 110 vac, 50-60 cycle | 235-002 |
| D1 | Diode, rectifier | 216-025 |
| D2,3,4,5,7,8 | Zener diode | 216-004 |
| D6 | Zener diode | 216-001 |
| Q1 | Transistor, silicon, PNP | 215-036 |
| Q2 | Transistor, silicon, NPN | 215-015 |
| R1 | Resistor, FC, 47Ω, ±10%, 1/2W | 201-470 |
| R2 | Resistor, FC | * |
| R3 | Resistor, FC, 3.3K, ±10%, 1/2W | 201-332 |
| R4 | Resistor, DC, 700Ω, ±1%, 1/2W | 205-032 |
| R5 | Resistor, NTC, 400Ω | 209-001 |
| R6 | Resistor, DC, 300Ω, ±1%, 1/2W | 205-021 |
| R7 | Resistor, WW | * |
| R8 | Resistor, DC, 6KΩ, ±1%, 1/2W | 205-042 |
| R9 | Resistor, WW, variable, 50Ω | 210-002 |
| R10 | Resistor, WW | ** |
| R11 | Resistor, WW, 27KΩ, ±.1% | 203-619 |
| R12 | Resistor, WW, 52.63Ω, ±.05% | 203-622 |
| R13 | Resistor, WW, variable, 1KΩ, +3%-0 | 210-102 |
| R14 | Resistor, WW, 50Ω, ±.05% | 203-621 |
| R15 | Resistor, WW, 5KΩ, ±.01% | 203-620 |
| R16 | Resistor, WW, variable, 10Ω | 210-001 |

# REPLACEMENT PARTS LIST

## PVR-1A/1AR

| Reference or Quantity | Description | Stock Number |
|---|---|---|
| C1A, B | Capacitor, dual, electrolytic, 100mf @ 50v | 222-013 |
| S1 | Switch, toggle, SPST | 240-025 |
| P1 | Lamp, neon | 262-001 |
| F1 | Fuse, 3AG, 1/8 amp | 261-001 |
| 3 | Terminal post, black | 263-106 |
| 2 | Terminal post, red | 263-105 |
| 1 | Knob, 10 turn | 214-004 |
| 1 | Line cord | 264-001 |

| | |
|---|---|
| * | Value selected in test |
| ** | Value selected in test |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